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[54] **REINFORCED CARBON HEATER WITH DISCRETE HEATING ZONES**

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[51] **Int. Cl.**[5] **A24F 47/00**

[52] **U.S. Cl.** **131/194;** 131/329; 131/273

[58] **Field of Search** 131/194, 195, 270, 271, 131/273, 329; 219/240, 543, 254; 392/386, 403, 404; 128/203.17, 203.27; 338/306–310, 225, 226, 332, 294

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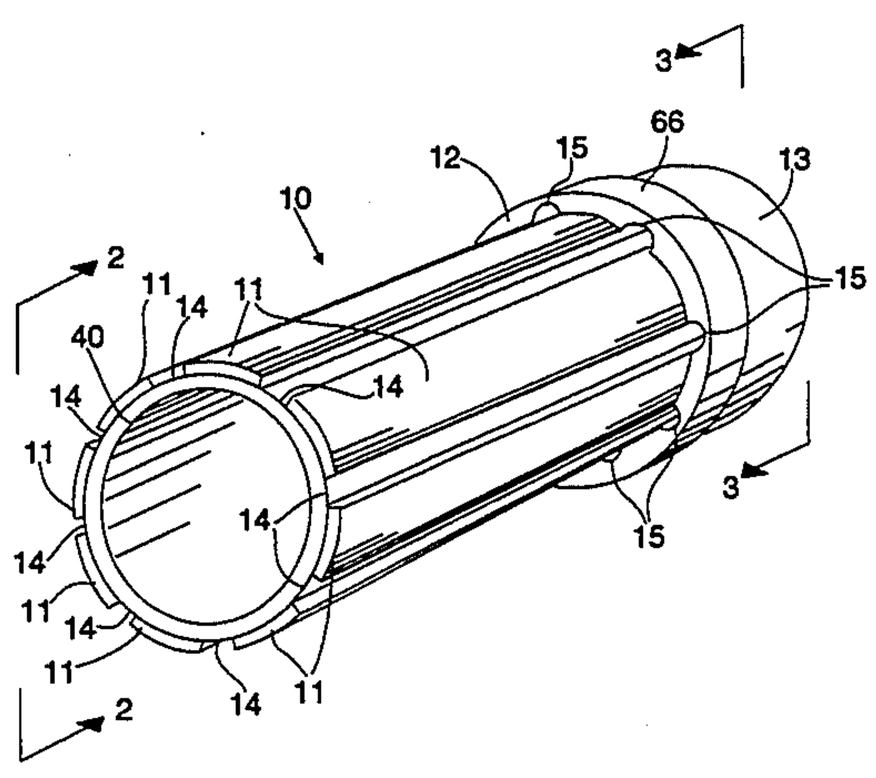
Attorney, Agent, or Firm—Charles E. B. Glenn; James E. Schardt; Kevin B. Osborne

[57] **ABSTRACT**

A bladed tubular array for use as a heating element in an electrical smoking article, and a tobacco flavor element for such an article based thereon, are provided. The integral carbon heater preferably provides eight thermally and electrically discrete heating zones to provide an optimized heating zone when each blade is individually powered. Each blade has a desired resistance, to provide temperature preferably in the range of from about 300° C. to about 900° C., or higher. The relatively brittle carbon composite conductive blades are supported by a reinforcing tube of spiral-wound paperboard. A common ring of the same conductive material serves as a common electrical terminal for the blades, while the free end of each blade serves as the other electrical terminal of that blade.

62 Claims, 6 Drawing Sheets



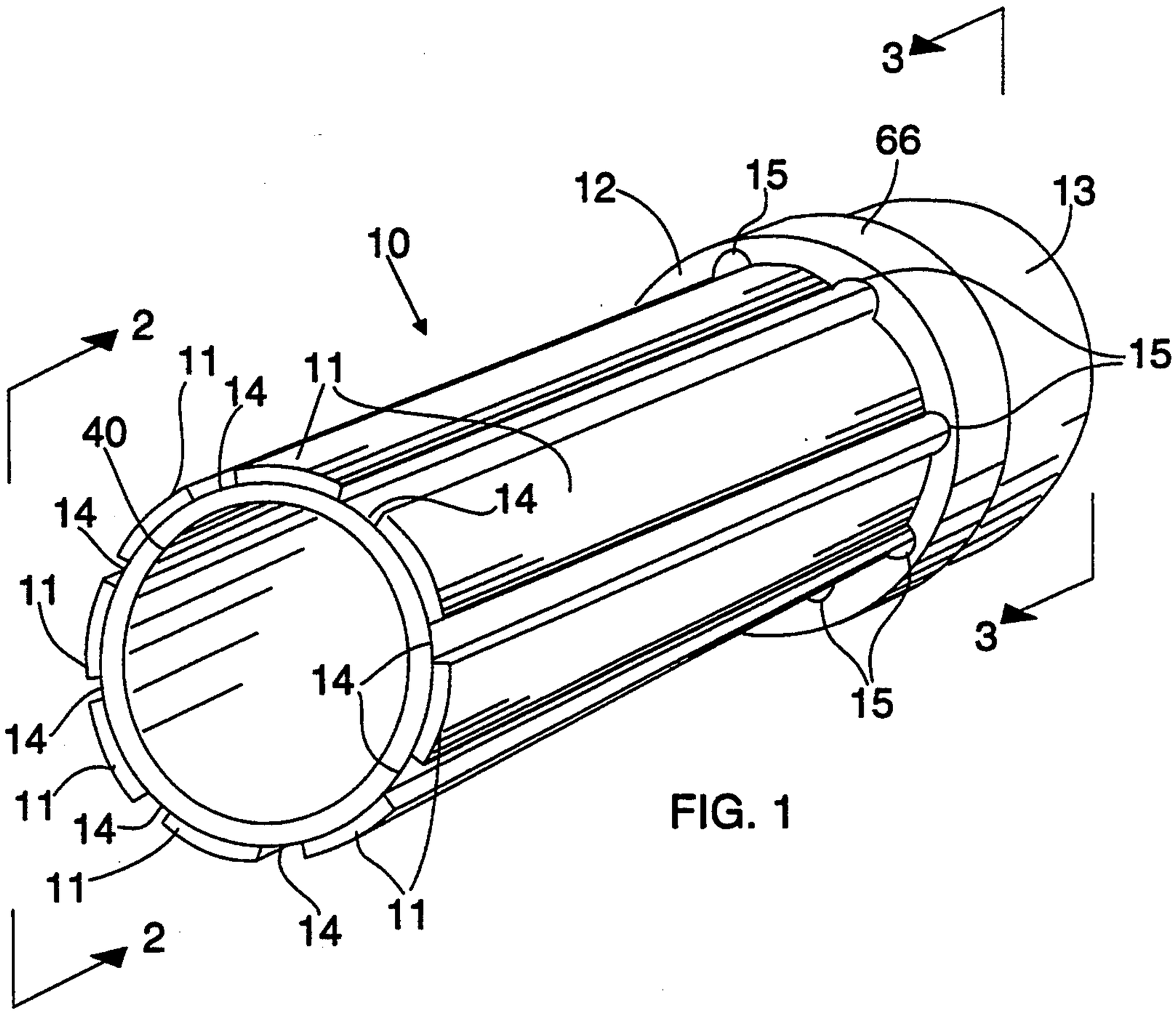


FIG. 1

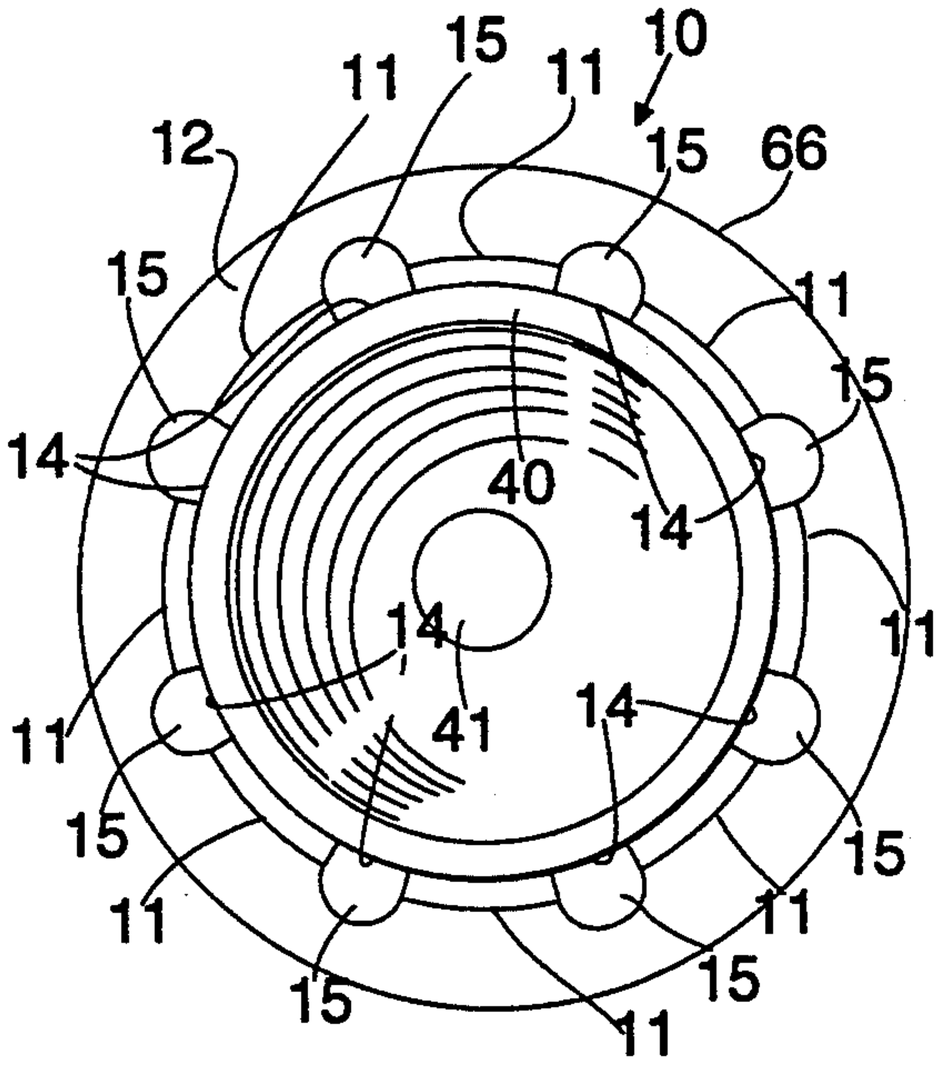


FIG. 2

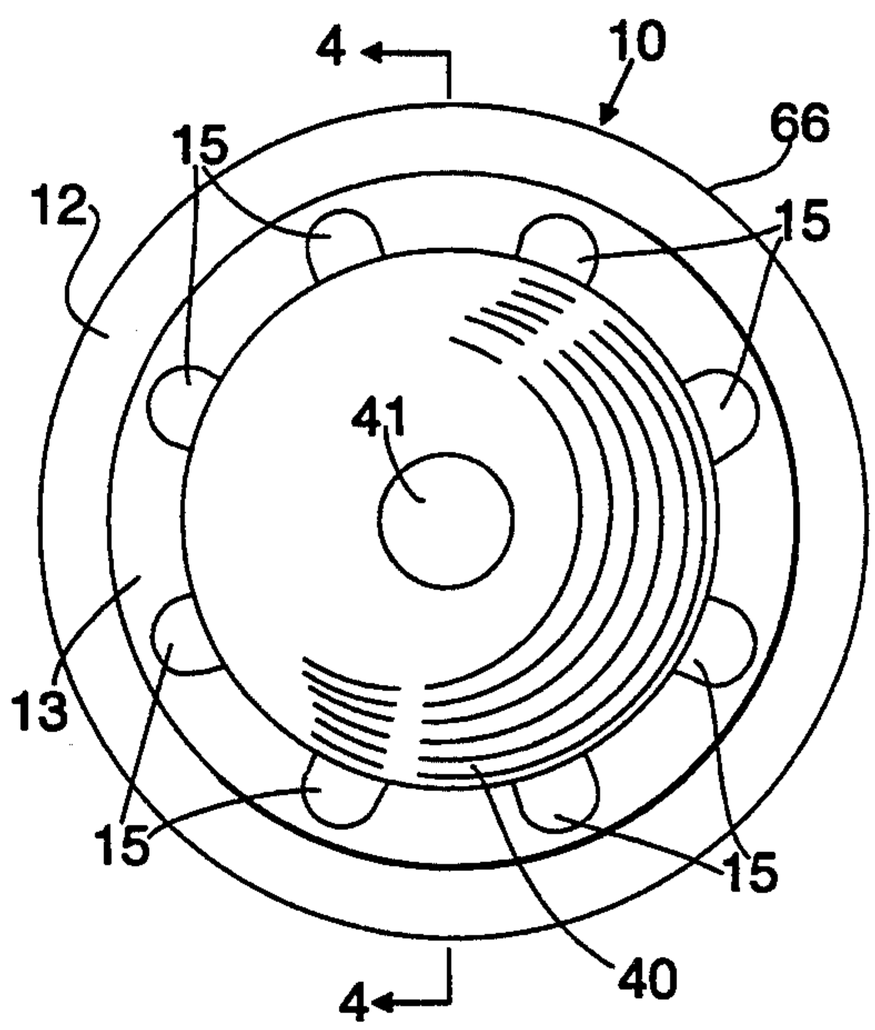


FIG. 3

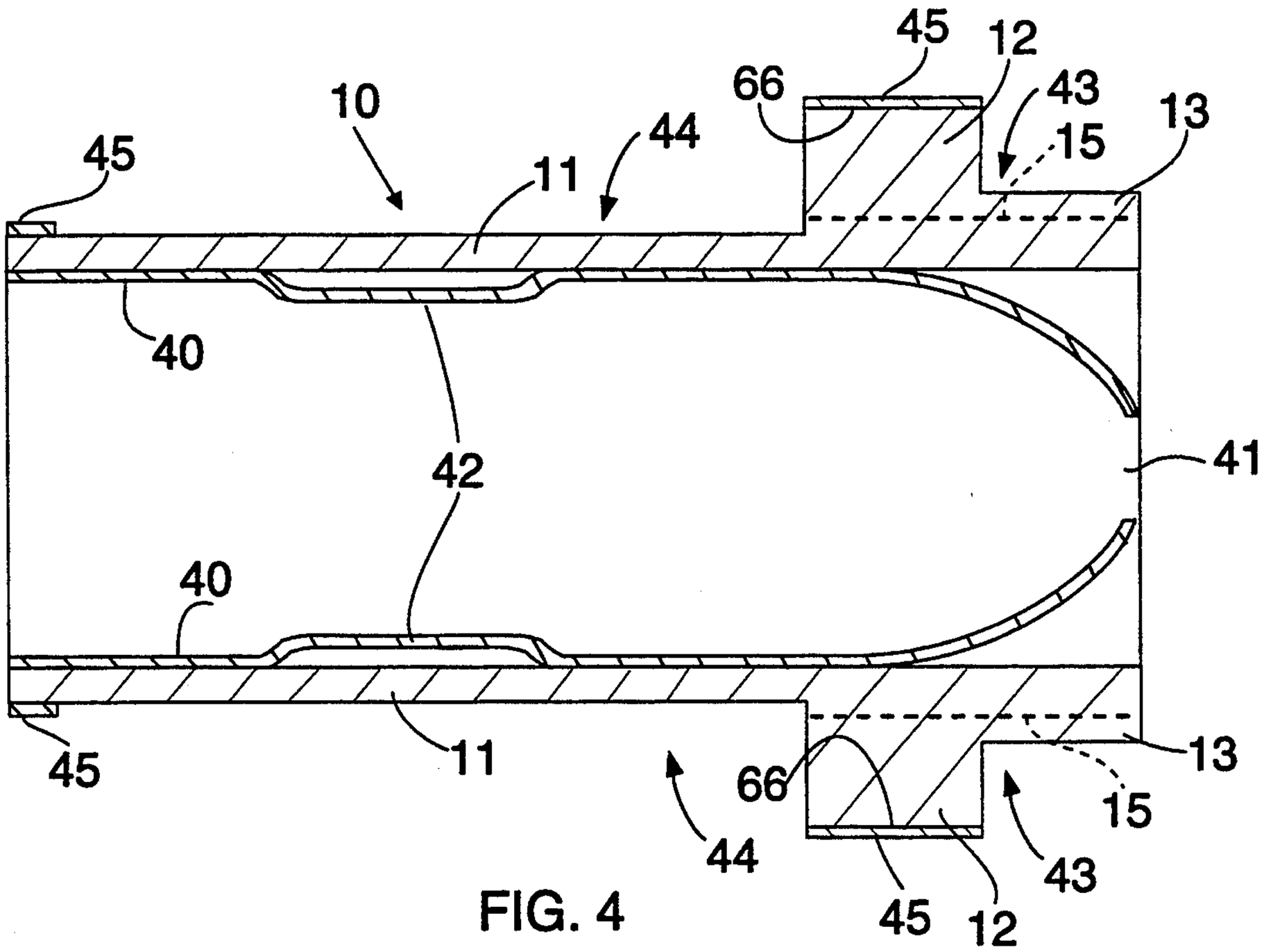

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FIG. 4

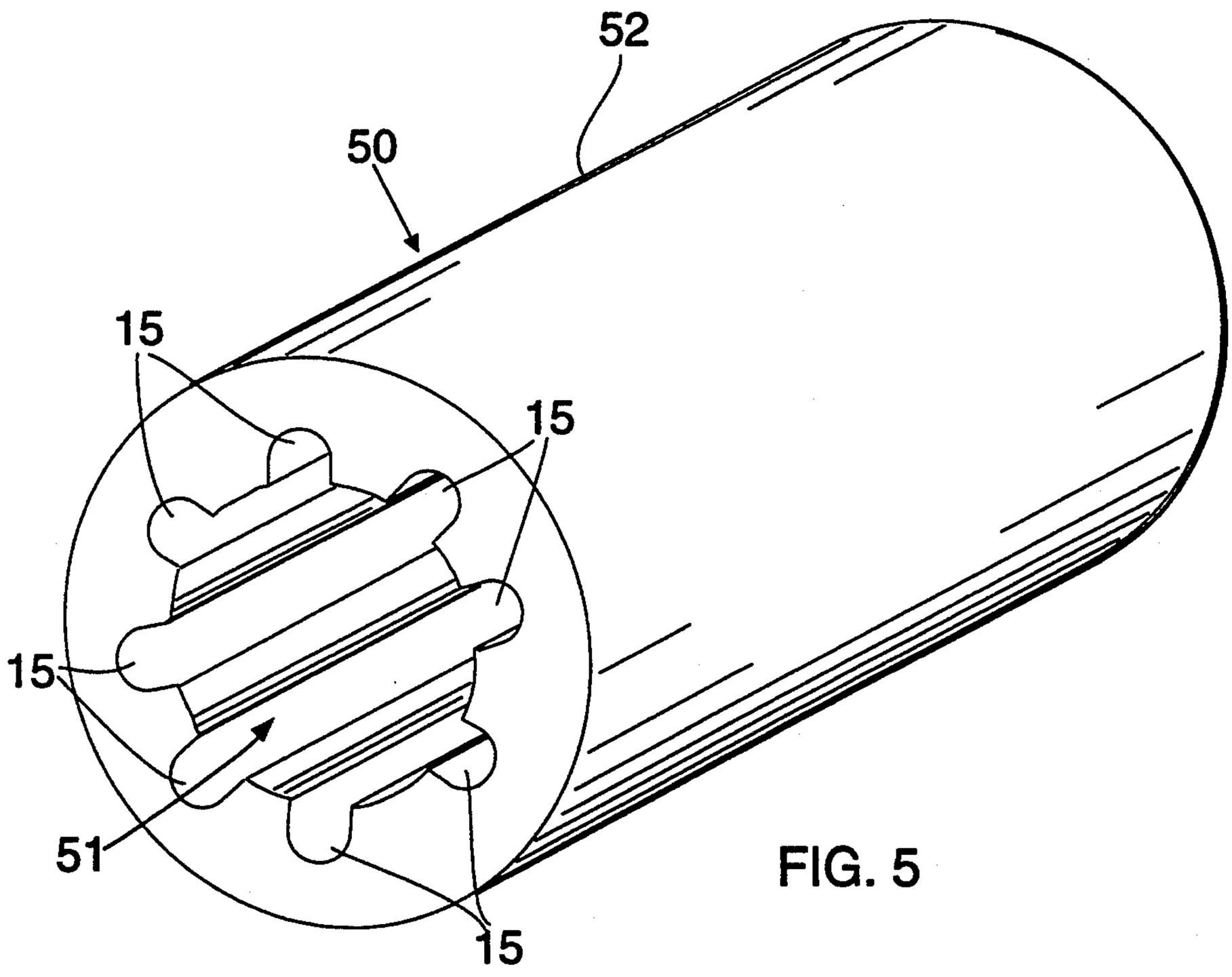
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FIG. 5

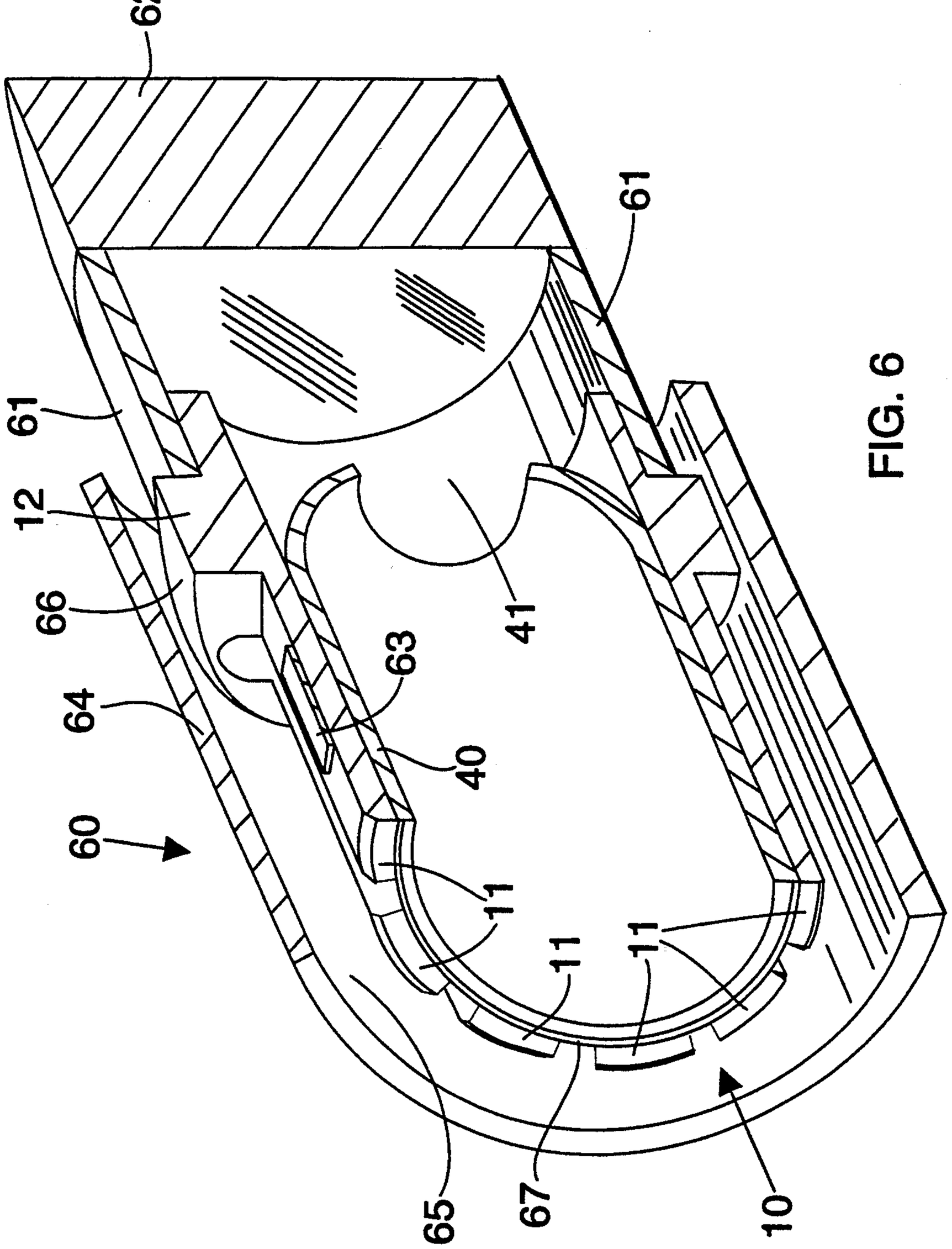

FIG. 6

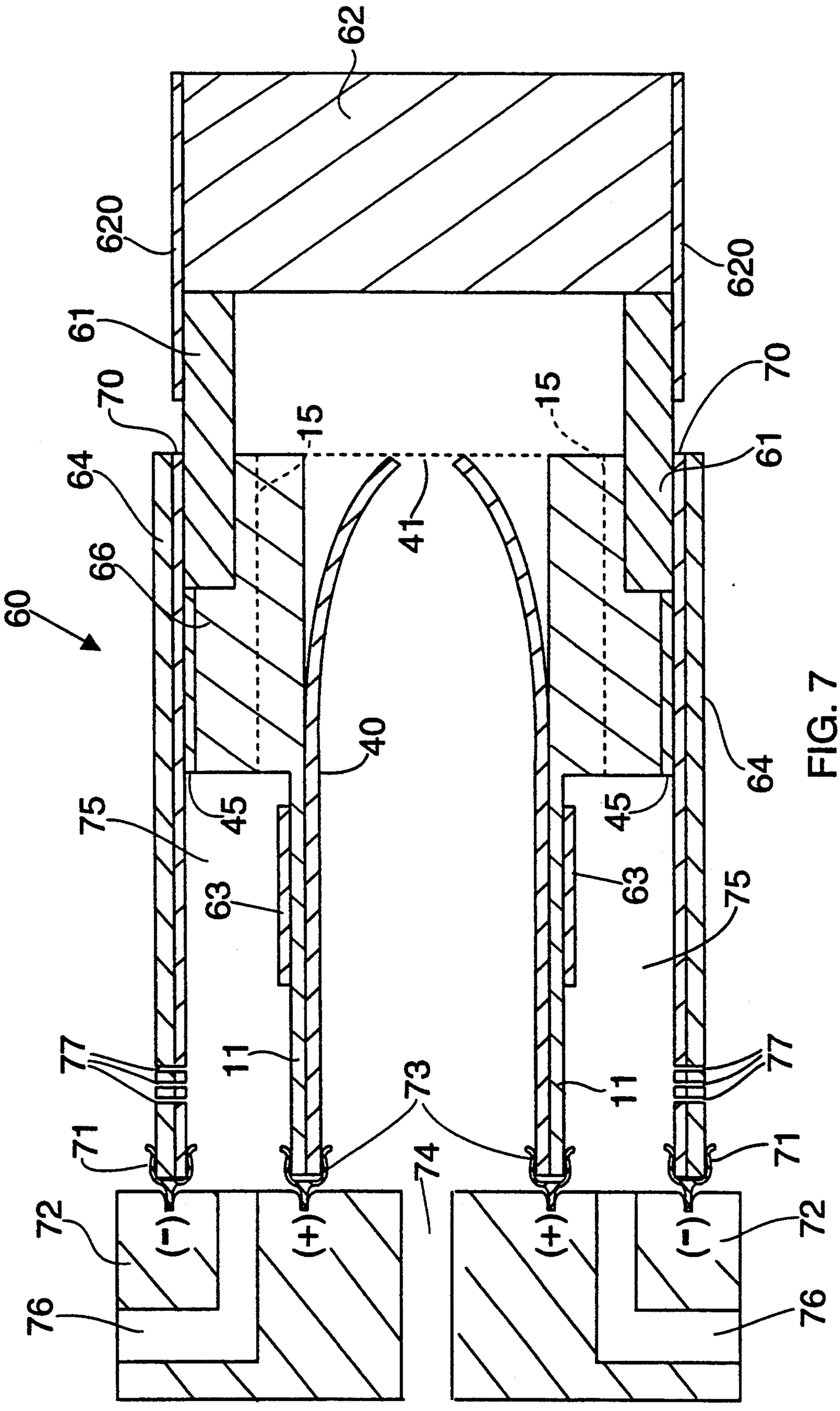
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FIG. 7

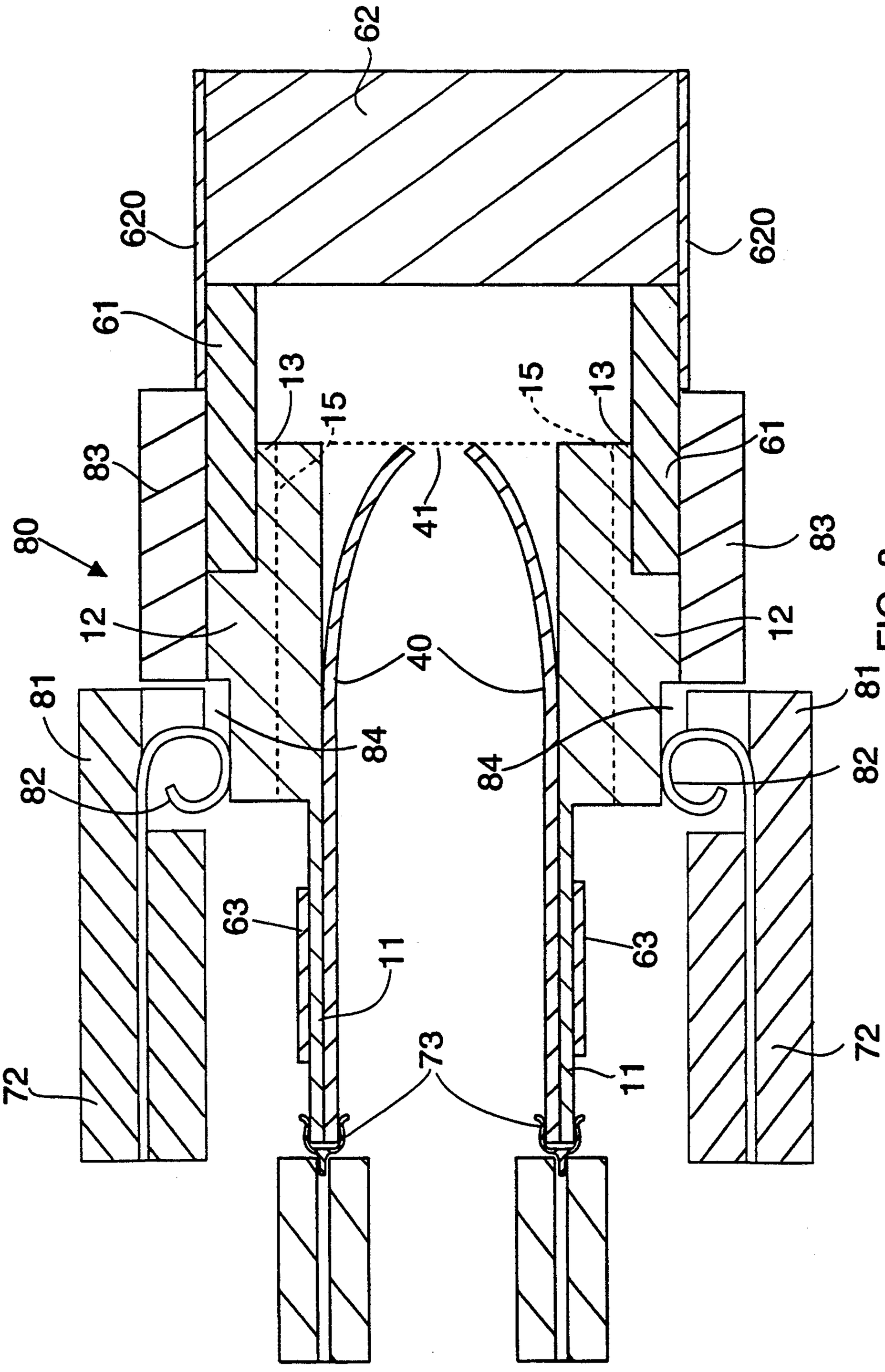
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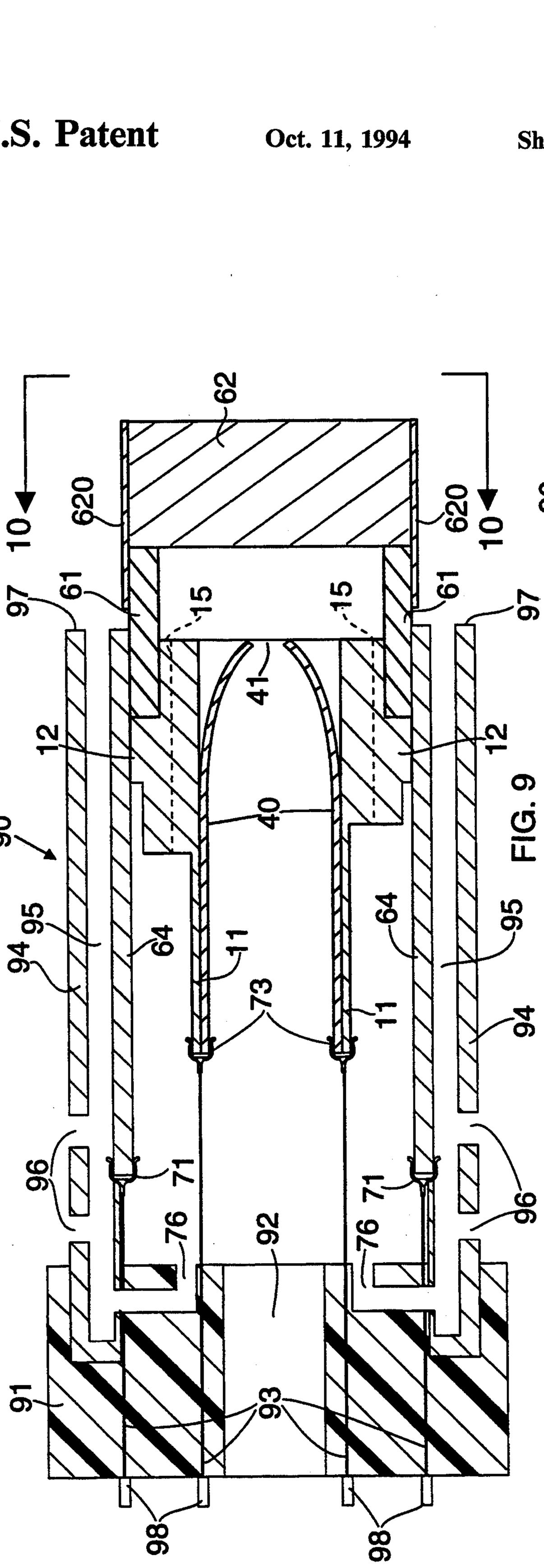
FIG. 8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620
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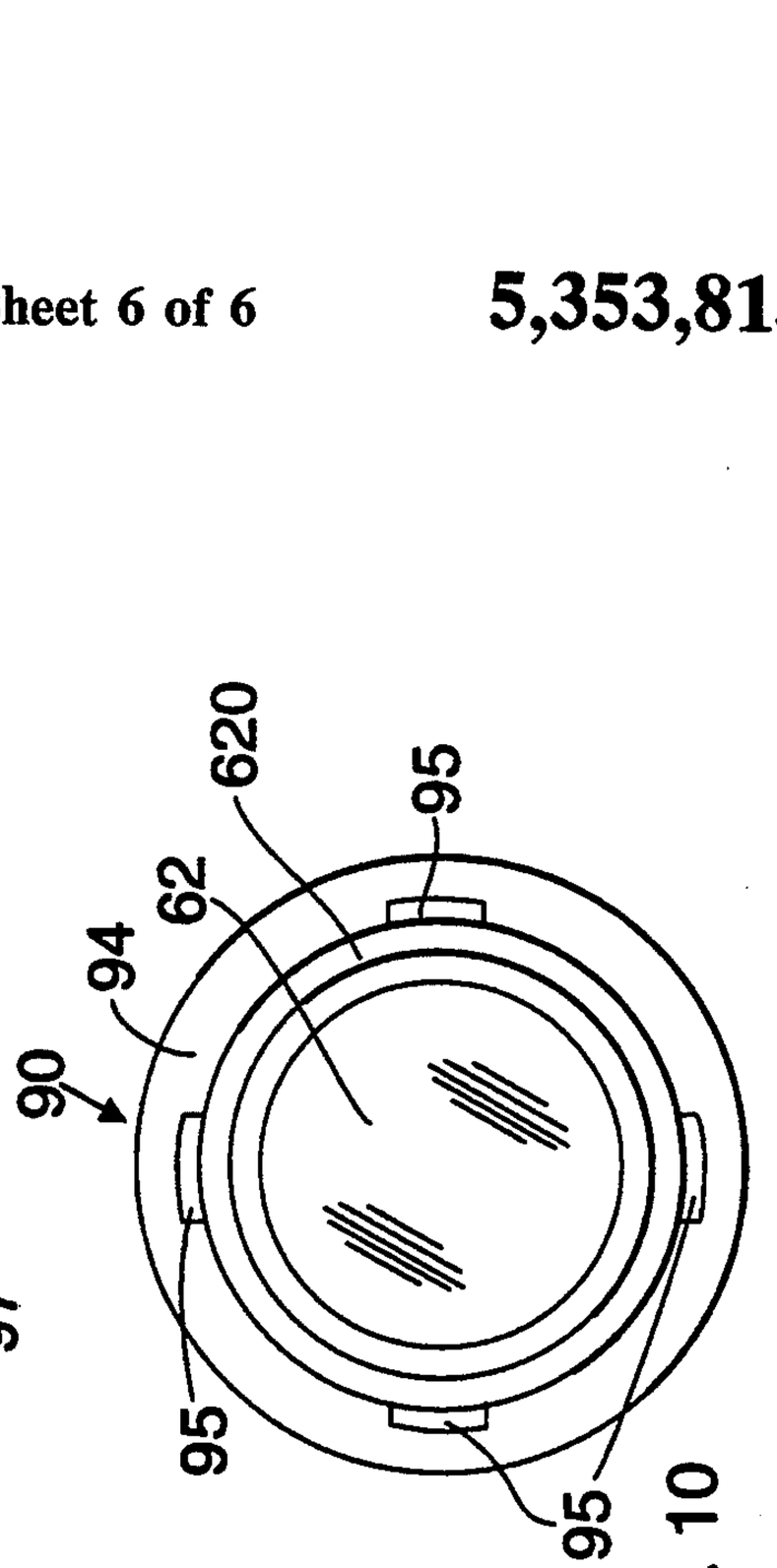
98

FIG. 9


620
95
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94
90
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95

FIG. 10

REINFORCED CARBON HEATER WITH DISCRETE HEATING ZONES

BACKGROUND OF THE INVENTION

This invention relates to electric heating elements used to heat a tobacco flavor generating medium in an electrical smoking article. In particular, this invention relates to such a heating element arranged in a tubular array.

One type of electrical smoking article is disclosed in commonly-assigned U.S. Patent No. 5,060,671 which is hereby incorporated by reference in its entirety. In such an electrical smoking article, a flavor bed of a tobacco flavor medium, such as tobacco or tobacco-derived substances, is heated electrically to release a tobacco flavor substance without burning. As the tobacco flavor medium is heated, a smoker at the mouth or downstream end of the device draws air in and around the heating element by inhaling, and thereby receives the tobacco flavor substance.

The above-identified application discloses a number of possible heater configurations, many of which are made from a carbon composite material formed into a desired shape. For example, one configuration involved a radial array of blades connected in common at the center and separately connectable at their outer edges to a source of electrical power. By depositing tobacco flavor medium on each blade and heating the blades individually, one could provide a predetermined number of discrete puffs to the smoker. Other configurations included various linear and tubular shapes, subdivided to provide a number of discrete heating areas.

Other configurations have been proposed. For example, various arrays of discrete fingers or blades of heater material can be provided, each blade providing one puff. However, suitable heater materials, such as those described in said above-incorporated U.S. Pat. No. 5,060,671 are generally not strong enough to be arranged in such a blade configuration without threat of blade breakage. This is particularly true of a preferred material made by mixing carbon, fillers and binders and curing and heating the mixture until the desired resistivity is achieved. This material has been found to have the proper electrical resistivity characteristics and evolves no undesirable constituents when heated to operating temperature.

Further, as disclosed in said above-incorporated U.S. Pat. No. 5,060,671, such heating elements are preferably disposable and replaceable. Therefore, they must be relatively inexpensive to produce.

It would be desirable to be able to provide an array of heater blades or fingers that is sufficiently strong for use in an electrical smoking article without danger of breakage.

It is also desirable to be able to provide such an array of heater blades that is sufficiently inexpensive to manufacture that it can be disposable.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an array of heater blades or fingers that is sufficiently strong for use in an electrical smoking article without danger of breakage.

It is also an object of this invention to provide such an array of heater blades that is sufficiently inexpensive to manufacture that it can be disposable.

Therefore, in accordance with the present invention there is provided a heating element for an an electrical smoking article. The heating element has a mouth end and a rod end and includes a ring or hub having a central axis, and a plurality of electrically conductive blades attached to the ring and extending in one direction parallel to the central axis. Each of the blades has a free end remote from the ring. The heating element has a hollow central core circumscribed by the ring and the blades. Finally, the heating element has support means disposed within the hollow central core for supporting the blades.

A tobacco flavor element for such an electrical smoking article is also provided, incorporating the heating element and a mouthpiece tube disposed about the heating element, thereby forming a fluid flow passage between the inner wall and the blade portion circumference. The mouthpiece tube has inner and outer walls and contact means on the inner wall for electrically contacting the ring. The tobacco flavor element also includes socket means having first electrical connector means for electrically contacting the contact means on the inner wall of the mouthpiece tube, and a plurality of second electrical connector means, corresponding to the plurality of blades, for electrically contacting each of the free ends of the blades. The socket also has main connector means for connecting to a power and control module of an electrical smoking article, as well as means for providing fluid communication between external atmosphere and the fluid flow passage adjacent the rod end. A tobacco flavor medium is disposed on the blades.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. **1** is a rod end perspective view of a preferred embodiment of a heating element in accordance with the present invention;

FIG. **2** is rod end elevational view of the heating element of FIG. **1** taken from line **2—2** of FIG. **1**;

FIG. **3** is a mouth end elevational view of the heating element of FIGS. **1** and **2** taken from line **3—3** of FIG. **1**;

FIG. **4** is longitudinal cross-sectional view of the heating element of FIGS. **1–3**, taken from line **4—4** of FIG. **3**;

FIG. **5** is a perspective view of a precursor of the heating element of FIGS. **1–4**;

FIG. **6** is a fragmentary perspective view taken from the rod end of a first preferred embodiment of a flavor generating element according to the present invention, incorporating the heating element of FIGS. **1–5**;

FIG. **7** is a longitudinal cross-sectional view of the tobacco flavor element of FIG. **6**, taken from line **7-7** of FIG. **6**;

FIG. **8** is a longitudinal cross-sectional view of a second preferred embodiment of a tobacco flavor element according to the present invention, incorporating the heating element of FIGS. **1–5**;

FIG. **9** is a longitudinal cross-sectional view of a third preferred embodiment of a tobacco flavor element according to the present invention, incorporating the heating element of FIGS. **1–5**; and

FIG. **10** is a mouth end elevational view of the tobacco flavor element of FIG. **9**, taken from line **10—10** of FIG. **9**.

DETAILED DESCRIPTION OF THE INVENTION

The heating element of the present invention is a tubularly-arranged array of finger-like heater blades connected to a common ring that serves as a common electrical terminal. The heating element is unitarily formed from an electrically conductive composition such as, preferably, the carbon composite material referred to above, with a reinforcing inner tube of paperboard or similar material. The blades all extend in one direction from the ring, parallel to the central axis of the ring, so that the overall appearance of the heating element is of a cylindrical element having a ring at one end with a number of blades extending toward the other end, where each blade end serves as its own electrical terminal. The number of blades corresponds to the number of puffs (preferably, e.g., at least about eight) it is desired to provide in an electrical smoking article into which the heating element is to be incorporated, and the portion of the circumference occupied by the blades exceeds the portion of the circumference occupied by the spaces between the blades. The ring has a greater diameter than the remainder of the heating element, and the spaces between the blades extend through the ring, for reasons which will become more apparent below.

When the heating element of the present invention is included in a tobacco flavor element, for subsequent inclusion in an electrical smoking article, its blades are coated with a tobacco flavor medium such as that disclosed in said above-incorporated U.S. Pat. No. 5,060,671.

The coated heating element is surrounded by a tube. The inner surface of the tube sits on the portion of the heating element which has the greatest diameter, which is the ring. Thus the inner surface of the tube is the preferred choice for completing the electrical connection to the outer surface of the ring. Appropriate metallic or other conductive terminals contact the inner surface of the tube, and also mechanically connect the tube to the remainder of the tobacco flavor element. Similar terminals contact the respective blade ends.

For this purpose, a conductive metallic layer is coated or laminated onto the inner surface of the tube. Similarly, a metallic layer is applied to the outer surface of the ring to reduce contact resistance between the outer surface of the ring and the inner surface of the tube. Some examples of appropriate techniques for applying the conductive metallic layers are described in G.W.A. Dummer, *Materials for Conductive and Resistive Functions* (Hayden Book Company, Inc., New York 1970), which is hereby incorporated by reference in its entirety, and particularly in Chapter Twelve thereof.

In at least one embodiment the tobacco flavor element includes a socket bearing the electrical terminals and connecting at its remote end to the power and control portion of the electrical smoking article for selective energizing of individual blades to generate tobacco flavor substance. This socket bears against the ends of the tube and the blades, and, together with the tube, the blades and the ring, define a void between the blades and the inner surface of the tube. It is into this void that the tobacco flavor substance is evolved. In order for the smoker to be able to draw on the tobacco flavor substance, passages are provided in the socket connecting the rod end of the void to the outside air. The above-mentioned extensions through the ring of the spaces between the blades connect the mouth end of the void to the outside air.

The invention will now be more particularly described in connection with its preferred embodiments, with reference to the FIGURES. A preferred embodiment of the heating element **10** of the invention is shown in FIGS. **1–4**. As shown, heating element **10** is generally cylindrical, with cylindrically-arranged carbon composite blades **11** unitarily formed with carbon composite ring or collar **12** and rearward tubular carbon composite extension **13**. Spaces **14** between blades **11** extend through ring **12** as passages **15**.

Reinforcing tube **40** is disposed in the hollow center of heating element **10** and has an outer diameter substantially the same as the inner diameter of the carbon composite portion of heating element **10**, so that reinforcing tube **40** supports blades **11** against breakage. Reinforcing tube **40** may have optional depressions **42** adjacent blades **11** for reasons to be discussed below. Reinforcing tube **40** tapers down to opening **41** at its mouth end for reasons also discussed below.

Heating element **10** may be made from an integral carbon composite precursor element **50**, shown in FIG. **5**, which is preferably extruded or molded with central bore **51** and passages **15** already provided. The outer surface **52** of precursor element **50** corresponds in diameter to that of ring **12** in the finished heating element **10**. Outer surface **52** is machined down in area **43**, without penetrating passages **15**, to form extension **13**. Outer surface **52** is machined down further in area **44**, penetrating passages **15** to form spaces **14** and individual blades **11**. The methods used to form, and to machine or grind, precursor element **50** may be those described in co-pending, commonly assigned U.S. patent application Ser. No. 07/932,224, filed concurrently herewith and hereby incorporated by reference in its entirety.

Reinforcing tube **40** is preferably made of paperboard, such as hard-calendared paperboard or cardboard, which is substantially non-combustible at the temperatures at which heating element **10** is expected to operate. Tube **40** may be formed by any suitable tube forming technique, such as conventional spiral-wound tube making processes. Tube **40** can be inserted into element **50** either before or after grinding of element **50**, but is preferably inserted before grinding so that it can support blades **11** during the grinding operation as well as afterwards. The tapered portion of tube **40**, referred to above, assists in insertion of tube **40** into element **50**, although it also serves another function as discussed below. Optionally, tube **40** may be adhered to element **50** by any suitable adhesive that can withstand the operating temperatures of heating element **10** without evolving undesirable compounds that might affect the taste of the electrical article.

A preferred embodiment of a tobacco flavor element **60** according to the invention is shown in FIGS. **6** and **7**. An extension tube **61** fits over extension **13** and is used to mate to heating element **10** a filter **62**, which may be made of any suitable filter material, such as cellulose acetate filter material as is commonly used in cigarette filters. Conventional tipping paper **620** may overlay filter **62**. Tobacco flavor medium **63**, such as that disclosed in said above-incorporated U.S. Pat. No. 5,060,671, is deposited on a central portion of each blade **11**.

A protective outer tube **64** is disposed around heating element **10**. The inner surface **65** of tube **64** is coated with a conductive material **70**, which is in contact with the outer surface of ring **12**. Conductive material **70** may be any conductive material that does not evolve undesirable compounds when heated. Material **70** can be in the form of a foil or foil laminate. Preferred materials are selected from the group consisting of gold, aluminum, copper and combinations thereof, and a particularly preferred material is aluminum, provided as part of an aluminum foil and paper laminate from which tube **64** is spiral-wound. If a metal that oxidizes readily, such as aluminum, is used, surface **66** of ring **12** would preferably be provided with sharp points (not shown) which, during assembly, would break through any oxide barrier that may have formed an surface **65**, to insure good electrical contact. In any case, surface **66** is itself coated with a conductive material **45**, such as gold, to decrease contact resistance.

Connectors **71** on permanent power and control module **72** receive tube **64** and hold it mechanically while electrically connecting it to module **72**. Similar connectors **73**, one for each blade **11**, mechanically and electrically connect blades **11** to module **72**. The ends of blades **11** can also be coated with conductive material **45** to decrease contact resistance.

As disclosed in said above-incorporated U.S. Pat. No. 5,060,071, module **72** includes a pressure sensitive switch (not shown) for sensing when a smoking puffs on the electrical smoking article. The interior of reinforcing tube **40**, communicating with the smoker's mouth through opening **41**, serves as the sensing chamber, which communicates with the switch through bore **74** of module **72**. The taper of tube **40** at opening **41** serves to decrease the likelihood of tobacco flavor substance entering the sensing chamber and possibly contaminating the pressure sensitive switch.

When the smoker puffs on the electrical smoking article, causing the heating of tobacco flavor medium **63** and the resulting production of a tobacco flavor aerosol in the void or chamber **75** between blades **11** and outer tube **64**, the smoker must be able to draw that aerosol through passages **15**. In order for that to occur, air must be able to flow into chamber **75** to replace the air drawn out. This can be accomplished in the embodiment of FIGS. **6** and **7** in at least two ways. First, passages **76** can be provided in module **72** communicating between the outside atmosphere and chamber **75**. Second, perforations **77** (additional perforations **77** not shown) can be provided in tube **64** and conductive layer **70**.

As discussed above, in order to assure that no undesirable compounds are produced when heating element **10** is actuated, depressions **42** may be provided in those portions of tube **40** underlying areas of blades **11** where the most heating will take place (i.e., where tobacco flavor medium **63** is deposited). This will assure that tube **40** will not char and generate off tastes.

Alternatively, a tobacco flavor material **67** may be applied to the outer surface of tube **40**, at least in the areas underlying blades **11**, so that any heating of tube **40** that occurs is used to generate additional tobacco flavor aerosol. Such a material may be coated onto the surface of tube **40**, or may be applied as an outer layer, such as a layer **67** of reconstituted tobacco sheet.

Another preferred embodiment of a tobacco flavor generating element **80** according to the present invention is shown in FIG. **8**. Tobacco flavor element **80** is similar to element **60**, except that tube **64**, contact layer **70** and connectors or sockets **71** are omitted. Instead module **72** has socket extension **81** which is lined with contacts **82**. A sliding sleeve **83** protects blades **11** and tobacco flavor medium **63** of tobacco flavor element **80** prior to insertion of tobacco flavor element **80** into socket **81**. Insertion of element **80** into socket **81** causes sleeve **83** to be pushed back, allowing contacts **82** to contact ring **12**. The outer surface of ring **12** in this embodiment is machined down a **84** to provide a stop as well as a conductive surface which again may be coated with conductive layer **70**.

A third preferred embodiment of a tobacco flavor element **90** according to the present invention is shown in FIGS. **9** and **10**. In this embodiment, which is similar to embodiments **60** and **80**, a socket module **91** is interposed between tobacco flavor element **90** and module **72**. Module **91** has a bore **92** which is the extension of bore **74**, while leads **93** from connectors **71**, **73** terminate in plugs **98** that mate with module **72**. This embodiment also includes an outer protective tube **94** (e.g., of aluminum) fixed to socket module **91**. This arrangement, as illustrated, would block air from entering passages **76**. For that reason, grooves **95** on the inner surface of tube **94** overlap passages **76** and allow air to flow out either through perforations **96** in the walls of tube **94**, or though the end wall **97** of tube **94**. If the latter option is chosen, care must be taken that end **97** is far enough from the mouth end that the smoker's lips will not cover it. Otherwise, grooves **95** will not serve their purpose of allowing outside air into passages **76** when the smoker draws on the article at filter **62**, because grooves **95** will also be in the smoker's mouth.

Heating element **10** and tobacco flavor element **60**, **80**, **90** are relatively inexpensive to produce, being made from the carbon composite material and relatively inexpensive cardboard and aluminum tubes, including reinforcing tube **40** that facilitates the blade heater arrangement. Only small amounts of relatively more expensive metals or other conductive materials are used. Heating element **10** and tobacco flavor element **60**, **80**, **90** can thus be produced inexpensively enough to be provided as disposable items.

EXAMPLES

Precursor element **50** can be made from a number of variations of the carbon composite material referred to above. Example of some of those variations follow.

EXAMPLE 1

475 grams of carbon were obtained by baking wheat flour in an inert atmosphere at 1000° F. for 12 hours, and then jet milling the resulting material four times to obtain the desired particle size distribution, with an average particle size of about 10 microns. The carbon had a volatiles content of about 15% by weight.

The carbon was blended for approximately 30 minutes in a Sigma blade mixer along with the following additional components:

- 300 grams of phenolic resin (grade SL486A, Borden Chemicals Co., Industrial Resins Division, Louisville, Ky.);
- 25 grams of carbon fiber chopped to 0.25 inch (Panex grade, Stackpole Corporation, Lowell, Mass.);
- 10 grams of methyl cellulose (grade M532, Fisher Scientific, Pittsburgh, Pa.);
- 25 grams of wheat flour; and
- 60 grams of water.

After blending, the mixture was extruded using a laboratory ram extruder into 12-inch long rods having an outer diameter of 10 mm. The rods were collected from the extruder head on U-notched graphite plates for ease of processing. The rods were oven dried in air for three days at 100° F., and then cured in a nitrogen atmosphere for 8 hours at 420° F. After curing of the rods, the graphite plates with the rods were placed in a stainless steel container and continually flushed with argon gas. The container was located in an oven and was baked according to the following cycle:

1. Raise temperature from 420° F. to 1,950° F. in five hours.
2. Hold temperature at 1,950° F. for five hours.
3. Cool to room temperature as fast as argon flushing allows.

The cooled plates and rods were removed from the stainless steel container and the rods were removed from the plates. The rods were ground to the shape illustrated above.

The rods were cut and ground, to form the shape illustrated above, until each blade had a resistance of between about 1.2 Ω and about 1.5 Ω. The blade ends and surface **66** were coated with gold to reduce contact resistance.

EXAMPLE 2

450 grams of carbon were obtained by baking wheat flour in an inert atmosphere at 600° F. for hours, and then jet milling the resulting material four times to obtain the desired particle size distribution, with an average particle size of about microns. The carbon had a volatiles content of about 15% by weight.

The carbon was blended for approximately minutes in a Sigma blade mixer along with the following additional components:

300 grams of phenolic resin (same as above);
50 grams of carbon fiber chopped to 0.25 inch (same as above);
60 grams of methyl cellulose (same as above);
25 grams of wheat flour; and
200 grams of water.

After blending, the mixture was processed as above.

EXAMPLE 3

475 grams of carbon were obtained by baking wheat flour in an inert atmosphere at 1000° F. for 12 hours, and then jet milling the resulting material four times to obtain the desired particle size distribution, with an average particle size of about 10 microns. The carbon had a volatiles content of about 15% by weight.

The carbon was blended for approximately 30 minutes in a Sigma blade mixer along with the following additional components:

300 grams of phenolic resin (same as above);
25 grams of carbon fiber chopped to 0.25 inch (same as above);
20 grams of methyl cellulose (same as above);
25 grams of wheat flour; and
90 grams of water.

After blending, the mixture was processed as above.

EXAMPLE 4

425 grams of carbon were obtained by baking wheat flour in an inert atmosphere at 950° F. for 12 hours, and then jet milling the resulting material four times to obtain the desired particle size distribution, with an average particle size of about 10 microns. The carbon had a volatiles content of about 15% by weight.

The carbon was blended for approximately 30 minutes in a Sigma blade mixer along with the following additional components:

300 grams of phenolic resin (same as above);
75 grams of carbon fiber chopped to 0.25 inch (same as above);
30 grams of methyl cellulose (same as above);
25 grams of wheat flour; and
130 grams of water.

After blending, the mixture was processed as above.

EXAMPLE 5

500 grams of carbon were obtained by baking wheat flour in an inert atmosphere at 1000° F. for 12 hours, and then jet milling the resulting material four times to obtain the desired particle size distribution, with an average particle size of about microns. The carbon had a volatiles content of about 15% y weight.

The carbon was blended for approximately 30 minutes in a Sigma blade mixer along with the following additional components:

400 grams of carbon fiber chopped to 0.25 inch (same as above); and
20 grams of methyl cellulose (same as above).

After blending, the mixture was processed as above.

Thus it is seen that a heating element and a tobacco flavor generating element for an electrical smoking article, using an inexpensive tubular array of heater blades, is provided. One skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of illustration and not of limitation, and the present invention is limited only by the claims which follow.

What is claimed is:

1. A heating element of an electrical smoking article, said heating element comprising:

a tubular support member;

a tubular array of spaced-apart, electrically conductive blades, said tubular support member received concentrically within said tubular array of blades and being non-unitary with said tubular array of blades;

a tobacco medium located adjacent said tubular array of blades;

said tubular array of blades including an electrically conductive ring portion, each of said blades fixed at one end to said ring portion, each of said blades including a free end remote from said ring portion;

a common electrical connection operative at said ring portion; and

a second, electrical connection operative at each of said free ends;

whereby, upon electrical communication of any blade to a power source through said common electrical connection and a respective second electrical connection, said blade becomes electrically heated to produce tobacco flavor from said tobacco flavor medium.

2. The electrical heating element of claim **1**, wherein said blades cover a greater portion of said tubular support member than spaces defined between said blades.

3. The electrical heating element of claim **1**, wherein said tobacco medium is disposed on said blades.

4. The electrical heating element of claim 1, wherein at least a portion of said tobacco medium is carried by said tubular support member.

5. The heating element of claim 1 wherein said blades comprise a carbon composite material.

6. The heating element of claim 5 wherein said carbon composite material comprises carbon, carbon fibers, and methyl cellulose.

7. The heating element of claim 6 wherein said carbon composite material further comprises flour.

8. The heating element of claim 6 wherein said carbon composite material further comprises phenolic resin.

9. The heating element of claim 6 wherein said carbon composite material further comprises water.

10. The heating element of claim 5 wherein said ring comprises said carbon composite material.

11. The heating element of claim 10 wherein said carbon composite material comprises carbon, carbon fibers, and methyl cellulose.

12. The heating element of claim 11 wherein said carbon composite material further comprises flour.

13. The heating element of claim 11 wherein said carbon composite material further comprises phenolic resin.

14. The heating element of claim 11 wherein said carbon composite material further comprises water.

15. The heating element of claim 1 wherein said ring has an exterior surface coated with a highly conductive material to reduce contact resistance.

16. The heating element of claim 15 wherein said highly conductive material is selected from the group consisting of gold, aluminum, copper, titanium, tantalum, tungsten and combinations thereof.

17. The heating element of claim 16 wherein said highly conductive material is gold.

18. The heating element of claim 1 wherein each said free end has an exterior surface coated with a highly conductive material to reduce contact resistance.

19. The heating element of claim 18 wherein said highly conductive material is selected from the group consisting of gold, aluminum, copper, titanium, tantalum, tungsten and combinations thereof.

20. The heating element of claim 19 wherein said highly conductive material is gold.

21. The heating element of claim 1 wherein an end of said tubular support member is tapered.

22. The heating element of claim 1 wherein said tubular support comprises paperboard.

23. The heating element of claim 22 wherein said paperboard tubular support member has an outer surface, said outer surface having therein angularly-spaced longitudinal depressions corresponding to locations of said blades.

24. The heating element of claim 22 wherein said paperboard tubular support member is spiral-wound.

25. A tobacco flavor element for an electrical smoking article, said tobacco flavor element comprising:

a heating element, including:

an electrical conductive ring having a circumference and a central axis,

a tubular array of spaced apart electrically conductive blades, said blades attached to said ring and extending in a direction parallel to said central axis and defining together a blade portion circumference, each of said blades having a free end remote from said ring, said ring circumference exceeding said blade portion circumference, said ring defining a common electrical contact operative with all of said blades, and

a tubular support disposed concentrically within said tubular array of blades, said tubular support supporting said blades;

a mouthpiece tube disposed concentrically about said heating element, said mouthpiece tube having inner and outer surfaces, at least a portion of said inner surface being electrically conductive and electrically contacting said ring, said mouthpiece tube and said tubular array of blades being spaced apart so as to define a fluid flow passage therebetween;

an electrical socket, said electrical socket comprising:

a first electrical connector electrically connecting said socket with said electrically conductive portion of said inner surface of said mouthpiece tube,

a plurality of second electrical connectors electrically connecting said socket to each of said free ends of said blades, and

main connector means for connecting said first and second electrical connectors to a power and control module of an electrical smoking article;

means for communicating said fluid flow passage with an external atmosphere; and

a tobacco flavor medium disposed on said blades.

26. The tobacco flavor element of claim 25 wherein said blades comprise a carbon composite material.

27. The tobacco flavor element of claim 26 wherein said carbon composite material comprises carbon, carbon fibers, and methyl cellulose.

28. The tobacco flavor element of claim 27 wherein said carbon composite material further comprises flour.

29. The tobacco flavor element of claim 27 wherein said carbon composite material further

30. The tobacco flavor element of claim 28 wherein said carbon composite material further comprises water.

31. The tobacco flavor element of claim 26 wherein said ring comprises said carbon composite material.

32. The tobacco flavor element of claim 31 wherein said carbon composite material comprises carbon, carbon fibers, and methyl cellulose.

33. The tobacco flavor element of claim 32 wherein said carbon composite material further comprises flour.

34. The tobacco flavor element of claim 32 wherein said carbon composite material further comprises phenolic resin.

35. The tobacco flavor element of claim 32 wherein said carbon composite material further comprises water.

36. The tobacco flavor element of claim 25, wherein said means for communicating comprises openings in said mouthpiece tube.

37. The tobacco flavor element of claim 25, wherein said means for communicating comprises channels in said socket, said channels communicating said fluid flow passage with the atmosphere.

38. The tobacco flavor element of claim 25 further comprising an outer protective tube concentrically disposed about said mouthpiece tube, said outer protective tube having passageways communicating said fluid flow passageway with the atmosphere.

39. The tobacco flavor element of claim 38 wherein:

said passageways pass through said outer protective tube.

40. The tobacco flavor element of claim 38 wherein:

said outer protective tube has an inner surface; and

said passageways comprise longitudinal grooves along said inner surface of said outer protective tube, said longitudinal grooves in registration with said communication means.

41. The tobacco flavor element of claim **25** wherein said ring has an exterior surface coated with a highly conductive material to reduce contact resistance.

42. The tobacco flavor element of claim **41** wherein said highly conductive material is selected from the group consisting of gold, aluminum, copper, titanium, tantalum, tungsten and combinations thereof.

43. The tobacco flavor element of claim **42** wherein said highly conductive material is gold.

44. The tobacco flavor element of claim **25** wherein each said free end has an exterior surface coated with a highly conductive material to reduce contact resistance.

45. The tobacco flavor element of claim **44** wherein said highly conductive material is selected from the group consisting of gold, aluminum, copper, titanium, tantalum, tungsten and combinations thereof.

46. The tobacco flavor element of claim **45** wherein said highly conductive material is gold.

47. The tobacco flavor element of claim **25** wherein said conductive portion of said inner surface of said mouthpiece tube comprises a metallic layer.

48. The tobacco flavor element of claim **47** wherein said metallic layer comprises a highly conductive material selected from the group consisting of gold, aluminum, copper, titanium, tantalum, tungsten and combinations thereof.

49. The tobacco flavor element of claim **47** wherein said metallic layer comprises a metallic foil.

50. The tobacco flavor element of claim **49** wherein said metallic layer comprises aluminum.

51. The tobacco flavor element of claim **25** wherein said ring has openings for allowing communication between a fluid flow passage and said mouth end of said tobacco flavor element.

52. The tobacco flavor element of claim **25** wherein said support has an outer surface, and a tobacco flavor material disposed on said outer surface.

53. The tobacco flavor element of claim **52** wherein said tobacco flavor material is formed as a sheet, said sheet forming said outer surface.

54. The tobacco flavor element of claim **53** wherein said sheet contains tobacco.

55. The tobacco flavor element of claim **54** wherein said sheet is reconstituted tobacco sheet.

56. The tobacco flavor element of claim **25** wherein said support comprises a substantially non-combustible tube.

57. The tobacco flavor element of claim **56** wherein an end of said substantially non-combustible tube is tapered.

58. The tobacco flavor element of claim **56** wherein said substantially non-combustible tube comprises paperboard.

59. The tobacco flavor element of claim **58** wherein said paperboard tube has an outer surface, said outer surface having therein angularly-spaced longitudinal depressions corresponding to locations of said blade.

60. The tobacco flavor element of claim **58** wherein said paperboard tube is spiral wound.

61. The tobacco flavor element of claim **25** further comprising a filter plug at a mouth end of said mouthpiece tube.

62. The tobacco flavor element of claim **61** wherein said free end of each of said blades is is distal from said mouth end and said ring is proximal to said mouth end.

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